

WHAT IS CLAIMED IS:

1. A force-feel system for a helicopter which does not require a mechanical spring and a trim-motor, thereby reducing the weight and cost of a force-feel system and making it practical to implement a force-feel system and a stability augmentation system in light-weight helicopters, the system comprising:

a feedback loop around a cockpit-flight-controller, the feedback loop configured to apply a force to the cockpit-flight-controller proportional to a deflection of the cockpit-flight-controller from a desired position, the feedback loop including:

a position sensor configured to measure an actual position of the cockpit-flight-controller;

a flight control device coupled to the position sensor, the flight control device configured to calculate the deflection and to determine the force based on a shaping function; and

a servo-actuator mechanically connected to and in parallel with a flight control system, the servo-actuator configured to apply the force to the cockpit-flight-controller and to be back-driven by the cockpit-flight-controller.

2. The force-feel system of Claim 1, further comprising an attitude sensor coupled to the flight control device to provide an indication of attitude, wherein the feedback loop is further configured to apply the force to the cockpit-flight-controller based on an attitude error.

3. A method for providing tactile feedback to a cockpit-flight-controller mechanically coupled to a control surface in a helicopter without requiring apparatus to be inserted into a break in an existing flight control system and without requiring the use of a mechanical spring and a trim-motor, thereby reducing the weight and cost of a force-feel system and making it possible to implement a force-feel system in light helicopters, the method comprising:

measuring the position of the cockpit-flight-controller;

receiving a signal from a trim switch proportional to a commanded position of the cockpit-flight-controller;

calculating the difference between the measured position and the commanded position; and

asserting a force on the cockpit-flight-controller based on the difference between the measured position and the commanded position of the cockpit-flight-controller.

4. The method of Claim 3, further comprising receiving a stability augmentation signal from a sensor and adjusting the force asserted on the cockpit-flight-controller in response to the stability augmentation signal.

5. The method of Claim 3, further comprising adjusting the force asserted on the cockpit-flight-controller proportional to an autopilot error correction signal.

6. A force-feel system for an aircraft having a cockpit-flight-controller configured to command a control surface, the system comprising:

a position sensor configured to measure a relative position of the cockpit-flight-controller;

a flight control device coupled to the position sensor, the flight control device configured to command a force at the cockpit-flight-controller as a function of the relative position of the cockpit-flight-controller; and

an actuator coupled to the flight control device, the actuator being mechanically coupled to and in parallel with the cockpit-flight-controller and the control surface.

7. The force-feel system of Claim 6, further comprising a trim switch configured to define a commanded position of the cockpit-flight-controller.

8. The force-feel system of Claim 7, wherein the flight control device is configured to calculate an error corresponding to the difference between the commanded position and the relative position of the cockpit-flight-controller.

9. The force-feel system of Claim 8, wherein the flight control device comprises a shaping function configured to correlate the error to the force commanded at the cockpit-flight-controller.

10. The force-feel system of Claim 6, further comprising a stability sensor coupled to the flight control device, wherein the flight control device is further configured to define a commanded vehicle state corresponding to a first stabilization signal received from the stability sensor.

11. The force-feel system of Claim 10, wherein the force-feel system is configured as an attitude-command-attitude-hold stability augmentation system.

12. The force-feel system of Claim 10, wherein the force-feel system is configured as a rate damper stability augmentation system.

13. The force-feel system of Claim 10, wherein the flight control device is configured to calculate an error corresponding to the difference between the commanded vehicle state and a second stabilization signal.

14. The force-feel system of Claim 13, wherein the flight control device is further configured to command the force at the cockpit-flight-controller as a function of the error.

15. The force-feel system of Claim 6, wherein the actuator comprises a motor configured to receive a signal from the flight control device proportional to the commanded force.

16. The force-feel system of Claim 15, wherein the actuator further comprises a gearing device coupled to the motor, wherein the gearing device is configured to provide mechanical advantage between the motor and the cockpit-flight-controller and to be back-driven by the cockpit-flight-controller.

17. The force-feel system of Claim 15, wherein the actuator further comprises a clutch coupled to the gearing device, wherein the clutch is configured to connect and disconnect the commanded force to the cockpit-flight-controller.

18. The force-feel system of Claim 6, wherein the flight control device is further configured to command the force at the cockpit-flight-controller in response to at least one autopilot error signal selected from the group consisting of altitude error, rate-of-climb error, speed error, heading error, and navigation error.

19. A force-feel system for a helicopter comprising:

- a means mechanically coupled to a control surface for allowing a user to command the control surface;

- a means for determining a deflection of the means mechanically coupled to the control surface; and

- a means coupled to and in parallel with the means mechanically coupled to the control surface for providing feedback to the means mechanically coupled to the control surface, wherein the feedback is proportional to the deflection.